IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

DENTAL MONITORING,	)	CASE NO.: 1:22-cv-00647-WCB
	)	CONSOLIDATED.
Plaintiff,	)	
	)	
v.	)	
	)	
GET-GRIN INC.,	)	
	)	
Defendant.	)	
	)	
	)	
	)	
	)	
	)	

DECLARATION OF LINA KARAM PH.D. IN SUPPORT OF GET-GRIN'S SUR-REPLY

CLAIM CONSTRUCTION BRIEF

TABLE OF CONTENTS

PAGE

i

1.   I, Lina Karam, have personal knowledge of the matters set forth herein and, if called as a witness, could and would competently testify thereto.

I.   INTRODUCTION

2.   I have been retained by Defendant Get-Grin Inc. ("Grin") as an expert in the above-captioned matter. My role is to provide my professional opinions with respect to the claim construction for U.S. Patent Nos. 11,314,983 ("the '983 patent"; D.I. 30-1, Ex. A) and 10,755,409 ("the '409 patent"; D.I. 30-1, Ex. B) (collectively, the "AI Patents") as well as the state of the art, background and prior art to the Asserted Patents.

3.   I previously submitted a declaration on November 22, 2023 in this matter in support of Grin's Answering Claim Construction Brief ("First Declaration"). I incorporate by reference Sections I – VIII of my First Declaration, as if set forth herein.

4.   I have been asked to respond to the declaration of Dr. John Mongan submitted by Plaintiff Dental Monitoring ("DM") in support of DM's Reply Claim Construction Brief (the "Mongan Declaration" or "Mongan Decl.").

II.   PERSON OF ORDINARY SKILL IN THE ART

5.   I disagree with Dental Monitoring's definition of a POSA, because a POSA for the asserted AI Patents would not need to have "worked as part of a multi-disciplinary team, which includes individuals familiar with medical imaging, dental imaging, dentistry, and/or orthodontics." Mongan Decl. ¶ 23. DM's definition does not specify how much work as part of a multi-disciplinary team is needed or why such experience is needed based on the factors to be considered in determining the level of ordinary skill in the art. DM and Dr. Mongan do not show any relation between this part of their definition and the inventions of the AI Patents. In paragraph 25 of his declaration, Dr. Mongan, in the abstract, discusses "solv[ing] problems in a particular domain" and "complex problems such as those in medical and dental imaging" but

does not address any of the problems solved by the AI Patents or how they support DM's proposed definition for a POSA.

6.   Even under DM's proposed definition of a POSA, I am at least a POSA because I have a Ph.D. in electrical engineering and over a decade of work experience relating to the development of machine learning or artificial intelligence models for image processing and/or computer vision. I have worked on numerous multi-disciplinary teams which have included individuals familiar with medical imaging. For example, I collaborated with multi-disciplinary teams at the Barrow Neurological Institute (BNI) on several projects within the medical imaging field. This collaboration resulted in several papers in medical imaging conferences and journals and in the successful completion of MS and PhD theses by graduate students whom I co-supervised. Furthermore, as part of this multi-disciplinary collaborative work, I supervised the development of a neuronavigation system that was adopted and deployed for brain surgery at BNI. I also worked and collaborated with multi-disciplinary teams at the Translational Genomics Institute (TGEN) on cell imaging projects. This work resulted in an issued U.S. patent (U.S. Patent 9,082,164) on which I am listed as an inventor in addition to co-authored published papers and a product that was adopted by TGEN, NYU School of Medicine and other companies.

III.   OPINIONS ON CLAIM CONSTRUCTIONS

1.   I have reviewed the opinions set forth in the Declaration of Dr. Mongan in support of DM's Reply Claim Construction Brief. Below, I have set forth my opinions responding to those of Dr. Mongan.

A.   A "Deep Learning Device" Employs A Deep Neural Network

2.   I incorporate by reference Section VII.A.1 of my First Declaration, as if set forth herein. As I explained there, a POSA at the time of the alleged invention for the AI Patents would have understood the term "deep learning device" to mean "a device that employs a deep

neural network to classify data after being trained on an input dataset." This construction is supported by the claims, specification, the knowledge of a POSA as well as the extrinsic evidence. For those reasons, I disagree with Dr. Mongan that a POSA would not understand the claimed deep learning device to employ a neural network. In addition, Dr. Mongan makes several errors that I address below.

3.   Dr. Mongan argues that an "'R-CNN' [neural network] comprises not just a convolutional neural network, but also a region proposal algorithm as well as class-specific linear support vector machine algorithms (SVMs)." Mongan Decl. ¶ 35. He relies on a paper (Reply Ex. R-3) for his position. Dr. Mongan's statement is incorrect. A POSA would know that a neural network is different from an SVM and that a neural network would not contain an SVM. This is evidenced from the paper Dr. Mongan relies on, which clearly distinguishes the R-CNN deep learning system's neural network from an SVM. For example, it explains that "[t]he second module is a large convolutional neural network that extracts a fixed-length feature vector from each region. The third module is a set of class-specific linear SVMs." Reply Ex. R-3, at 2. The reference goes on to "discuss the trade-offs involved in training detection SVMs rather than simply using the outputs from the final softmax layer of the fine-tuned CNN." *Id.* at 4. A POSA would understand that the paper (Reply Ex. R-3) is using R-CNN's neural network and SVM consistent with their ordinary meanings and that the two are distinct. In addition, a POSA would understand that the reference to "region proposal" in the paper (Ex. R-3) is a reference to a data pre-preprocessing module that can be implemented using a CNN and/or other methods and that is part of the R-CNN module. *Id.* at 2-3.

4.   For the reasons discussed in Sections VII.A.1 of my First Declaration, a POSA would understand a "deep learning device" to employ a deep neural network, and a POSA would be unable to implement a deep learning device without a deep neural network.

B.   A "Deep Learning Device" and a "Neural Network" Classify Data

5.   I disagree with Dr. Mongan's opinions relating to whether a deep learning device and a neural network perform classification. A POSA would understand that both perform classification. I incorporate by reference Sections VII.A.2 and VII.B of my First Declaration as if set forth herein.

6.   Dr. Mongan gives two supposed examples of functions that a deep learning device would perform that do not involve classification: feature extraction and regression analysis. Mongan Decl. ¶¶ 45-54. Dr. Mongan is incorrect that they do not involve classification.

7.   Regarding feature extraction, Dr. Mongan claims that one could use feature extraction to transform data into a "more manageable and meaningful form" and explains how feature extraction can be done by one device while another classifies the data. Mongan Decl. ¶ 47. However, the determination as to whether raw data is "manageable" or "meaningful" necessarily involves classification.

8.   Dr. Mongan states that feature extraction is a prerequisite for data classification, but that is only partly true. For the data to be transformed into "meaningful" extracted features by a deep learning device (and/or neural network), the deep learning device (and/or neural network) needs to be trained to extract features to perform the desired classification task for it to be able to learn "meaningful" features for the classification. Thus, the performed learned feature extraction is an inherent part of the classification task.

9.   It should be noted that the AI Patents require training of the deep learning device (and/or neural network). In the case of transfer learning, an already trained deep learning network

can be adopted for feature extraction without training, which is not within the scope of the AI

Patents. Even if DM argues that transfer learning, wherein training is not performed, is within

the scope of the AI Patents, which I disagree with, the subsequent layers of the deep learning

device still need to be trained to learn how best to utilize the features that are output by the

adopted deep network for the classification task at hand.   Therefore, the training for the

classification task is performed to optimize the classification based on the extracted features and

cannot be done without making use of these features; this shows that the extracted features are

an inherent part of the classification. In other words, a POSA would not use a neural network

and/or a deep learning device just to extract features for its own sake. A POSA would understand

that the purpose of feature extraction is to classify the input data.

10.   Dr. Mongan proposes an R-CNN as an example incorporating a deep neural

network (a CNN) that extracts features but does not classify them. However, a POSA would

understand that a CNN is part of the deep learning classifier system.

11.   In fact, each of Dr. Mongan's proposed examples—an R-CNN, a Faster R-CNN,

and an SSD—all classify data. They may perform additional functions, but that does not mean

they do not also classify data.

12.   Dr. Mongan leaves unanswered a crucial question in his examples and

explanations as to why a deep learning device and neural network do not classify data: how would

a neural network or deep learning device using a neural network recognize a pattern without

assigning that pattern to a category? A POSA would understand that is not possible without

classification and that classification must occur.

13.   Dr. Mongan also claims that regression is an example of a function a deep learning

device can perform that does not involve classification. But his description of regression is

incorrect and the examples he cites are misleading. A computer cannot perform true continuous regression (*i.e.,* regression on continuous values). A POSA would understand that, when using digital computers, the predicted values in a regression analysis are still discretized and, thus, are represented using a finite number of categories (i.e., classes) each corresponding to a distinct value.

14.   A POSA would, then, understand that all of Dr. Mongan's examples cited in ¶¶ 50-51 of Dr. Mongan's declaration perform discretized regression and not regression on continuous values.

15.   Indeed, even the SSD example uses discretized regression. The SSD described in Get-Grin's Ex. 7 uses bounding box regression. (Liu, et al.*, SSD: Single Shot MultiBox Detector* (Dec. 29, 2016). But a POSA would understand that this type of regression is still classification on a discrete number of bounding boxes.

C.   "Creation of a Learning Base"

16.   I incorporate by reference Section VII.C of my First Declaration, as if set forth herein. As I explained there, a POSA at the time of the alleged invention for the AI Patents would have understood the term "creation of a learning base" to mean "acquiring images and identifying and storing attribute values for acquired images to create a database to be used in the training of the Deep Learning Device." This construction is supported by the claims, specification, the knowledge of a POSA as well as the extrinsic evidence. For those reasons, I disagree with Dr. Mongan that a POSA would understand the term to mean "creation of a collection of images and corresponding attribute values for those images." In addition, Dr. Mongan makes several errors that I address below.

17.   Dr. Mongan states that a "POSA would understand that a learning base could be created by compiling or collecting images and annotation data from online resources." Mongan

Decl. ¶ 64. I agree with this and discussed this at paragraph 64 of my First Declaration. I disagree, however, with Dr. Mongan's next statement that "[t]his would not require the step of individually identifying image attribute values." *Id.* Even if the images are collected from online sources and already have "annotations," which I understand Dr. Mongan considers to be the claimed attribute values, those attribute values would need to have been identified. "Attribute values" must be identified before they can exist and be added to a learning base, and this is part of the creation of the learning base, even if it was performed by different actors.

18.   I also disagree with paragraph 66 of Dr. Mongan's Declaration. Dr. Mongan claims that the steps of acquisition, identification and addition are recited in dependent claims 6 and 7 of the '983 patent, and claims 8 and 9 of the '409 patent. Mongan Decl. ¶ 66. Dr. Mongan, however, fails to recognize that the dependent claims he relies on are directed to the updating of the learning base and in fact support Grin's construction, that the creation of the learning base involves acquiring images, identifying attribute values and storing them.

19.   In paragraph 67 of his declaration, Dr. Mongan disputes the inclusion of "database" in Grin's construction. Mongan Decl. ¶ 67. But Dr. Mongan does not explain how a "database" differs from a "base" and what "base" means if it is not a database. *Id.* A POSA at the time of the inventions would have understood the claim term "base" to be referring to a "database."

20.   I also disagree with Dr. Mongan's "intent" argument in paragraph 68 of his declaration. Mongan Decl. ¶ 68. The language "to be used in the training of the Deep Learning Device" in Grin's construction is based on the plain claim language that the analysis image is analyzed "by means of a deep learning device trained by means of a learning base." *See, e.g.,* '409 patent at 32:17-18. I disagree that Grin's construction imposes an intent requirement or

precludes using a learning base that is created for some other use so long as it is used in the training of the deep learning device.

IV.   CONCLUSION

21.   I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

This declaration was executed on December 20, 2023 in Scottsdale, Arizona.

By:_____
                        Lina Karam